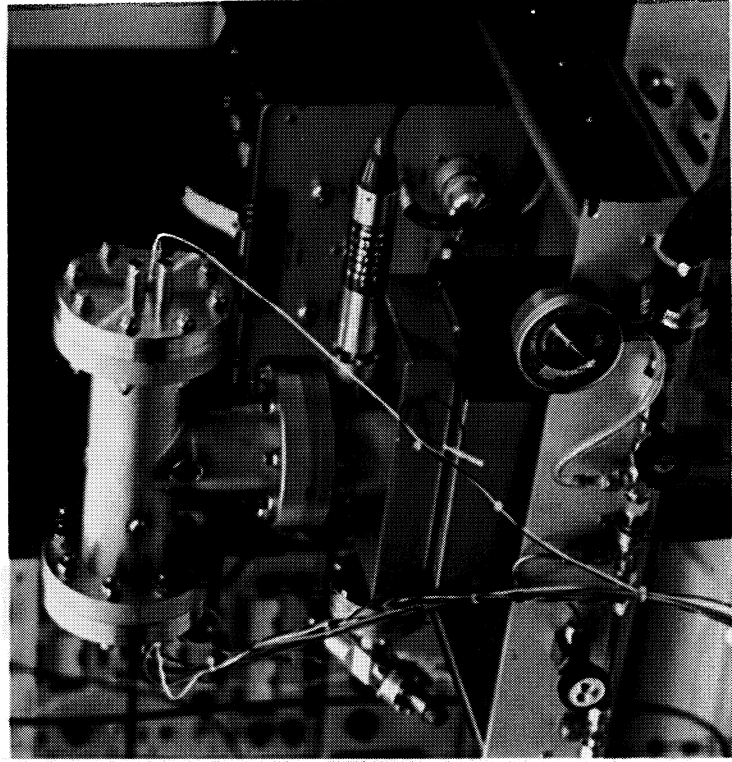


pollution control



Small mass spectrometer is being developed to monitor hydrocarbons in the air aboard aircraft and ships. It also could be used to warn against respiration problems of patients under anesthesia.

Trace-gas monitoring

Space technology is contributing to air-pollution control primarily through improved detectors and analysis methods. In one program at NASA-Langley, a miniaturized mass spectrometer is under development to monitor vinyl chloride and other hydrocarbon contaminants in an airborne laboratory.

The portable system, using a 2-in. quadrupole and hyperbolic rods, will include a microprocessor for real-time data acquisition. Supported by the Environmental Protection Agency and the Air Force's School of Aviation Medicine, NASA is directing the development, which is expected to be ready for testing next July.

The miniaturized mass spectrometer can be used to protect personnel in naval and medical operations, as well as aboard aircraft. For instance, an advanced warning of respiration problems of patients under anesthesia can make surgery safer. The EPA is interested in the instrument for monitoring vinyl chloride and other hydrocarbon contaminants in the air.

Small-particle pollutants

Fly ash and urban aerosols seem to have a high concentration of toxic elements in very small particles. These submicron-size particles are too small to be filtered by ordinary methods and so can enter the human bloodstream easily when inhaled.

NASA's Langley Research Center is cooperating with the Environmental Protection Agency to measure the particle sizes of all elements in aerosols from airports, coal-fired power stations, municipal waste incinerators, and other combustion aerosol sources. If toxic elements are found among these small-size aerosols in harmful quantities, means will have to be improvised for reducing them. The problem is especially important because of the anticipated increase in the number of coal-fueled electric power plants in the next decade.

Langley intends to sample the air using its proton-induced X-ray emission technique initially developed to determine aerosols in jet-engine exhaust.

The Langley proton technique is important because no other rapid, nondestructive method now exists for measuring trace-element compositions of massive amounts of air. The method also can analyze human tissues and hair samples to determine exposure to the toxic elements.

The NASA work is expected to provide the major input to the EPA's new National Environmental Specimen Bank. Because the proton technique is nondestructive, specimens can be kept in the bank to help determine when new pollutants emerge, as well as to follow trends of known pollutants.

Carbon-monoxide detector

Another technical approach to pollution detection, which was used aboard Skylab, is nondispersive infrared spectroscopy. The principle was utilized to develop a carbon-monoxide detector for the Skylab cabin.

Previous nondispersive analyzers could not selectively distinguish between water vapor and carbon monoxide, thus necessitating water removal by another device before measurement. These analyzers also were susceptible to vibrations and other problems. The new instrument, which stimulates fluorescence in two carbon-monoxide isotopes in two sealed cells, eliminates these problems and increases sensitivity to a tenth of a part per million.

A company later reorganized into Andros Inc., Berkeley, Calif., developed the instrument under contract with Ames Research Center. Now produced and sold by Beckman Instruments Inc., Anaheim, Calif., the instrument is in use by state and federal agencies.

For example, the EPA flew it in a helicopter to determine the carbon-monoxide profile of the Los Angeles basin. No other carbon-monoxide analyzer could be used in this fashion.